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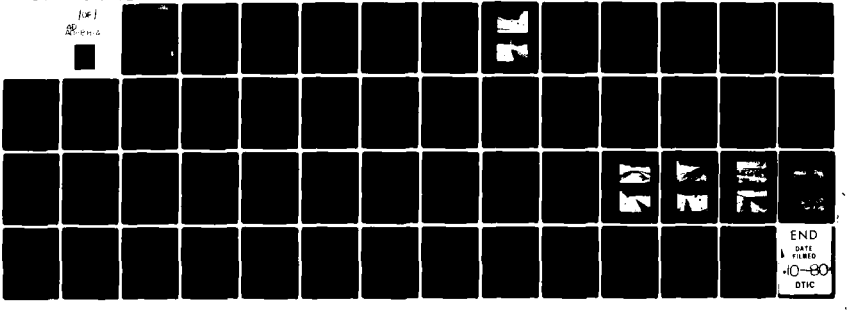

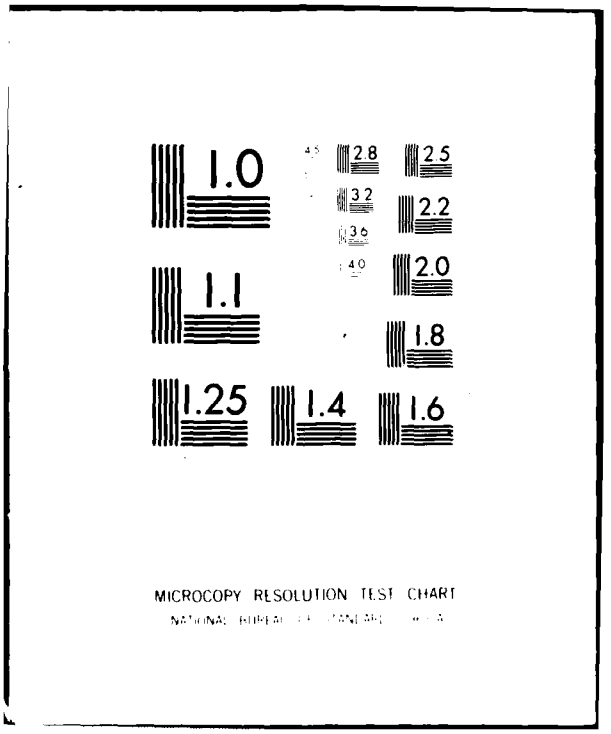
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PATAPSCO RIVER BASIN
STONY RUN, BALTIMORE CITY

MARYLAND

GUILFORD RESERVOIR

NDI ID NO.MD-106

CITY OF BALTIMORE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DACW31-80-C-0050

Prepared For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

By
RUMMEL, KLEPPER & KAHL
Consulting Engineers
Baltimore, Maryland 21202

JUNE 1980

(6) National Dam Inspection Program
Guilford Reservoir
(NII-Identification Number-MD-106)

PATAPSCO RIVER BASIN,

STONY RUN, BALTIMORE CITY,

MARYLAND

~~GUILFORD RESERVOIR~~

~~NDI ID NO. MD-106~~

~~DEPARTMENT OF PUBLIC PUBLIC WORKS~~

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

(11) June 80

(12) 52

Prepared for:
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(15) DACW31-80-C-0059

By:
RUMMEL, KLEPPER & KAHL
Consulting Engineers
1035 N. Calvert Street
Baltimore, Maryland 21202

June, 1980

411913

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

PATAPSCO RIVER BASIN
STONY RUN, BALTIMORE CITY

MARYLAND

GUILFORD RESERVOIR

NDI ID NO. MD-106

CITY OF BALTIMORE
DEPARTMENT OF PUBLIC WORKS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

June, 1980

CONTENTS

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION
AND RECOMMENDED ACTION

Name of Dam:	Guilford Reservoir NDI ID No. MD-106
Size:	Small (134 acre-feet, 35 feet high)
Hazard Classification:	High
Owner:	City of Baltimore Department of Public Works 600 Municipal Office Building Baltimore, Maryland 21202
State Located:	Maryland
City Located:	Baltimore
Stream:	Stony Run
Date of Inspection:	May 28, 1980

Based on the visual inspection, available records, past operational performance, and in accordance with the guideline criteria established for these studies, Guilford Reservoir is judged to be in good condition.

Guilford Reservoir, a square-shaped impoundment is totally enclosed by an embankment which rises above the existing topography around its perimeter. Finished water from the Ashburton Water Purification Plant is normally fed through the Baltimore City water transmission system by gravity to the Guilford Reservoir. On occasion, flow to the reservoir is supplemented by pumpage from the Vernon Pumping Station. Water levels in the reservoir are generally maintained between elevations 338 and 340.4. When the water level reaches elevati n 340.4, electrically operated butterfly valves are closed to stop inflow into the reservoir. When the water demand has caused the reservoir level to drop 1 to 2 feet, the valves are opened to allow the reservoir to refill.

Because all inflow into the reservoir is controlled with the exception of rainfall directly on the water surface, flood routing and detailed hydraulic and hydrologic analyses are not required.

No embankment stability problems were evident at the time of the inspection, however surface erosion and a possible seepage area were noted along the southern and southwest portions of the embankment.

The following remedial measures are recommended to be accomplished by the Owner:

1. Investigate the seepage area in the southwest corner of the embankment using either experienced in-house personnel or by contract with a qualified engineering firm possessing geotechnical engineering expertise. After investigation, implement recommended corrective measures to eliminate or control the seepage.

2. Repair the surface erosion located along the southern portions of the embankment.

3. Expand the maintenance program to include regularly scheduled inspections of the embankment and determine whether surface erosion and/or future seepage is occuring and needs correction.

4. Develop a formal warning system to alert the downslope residents in the event of emergencies.

Submitted by:

RUMMEL, KLEPPER & KAHL

Edward J. Zeigler, P.E.
Associate

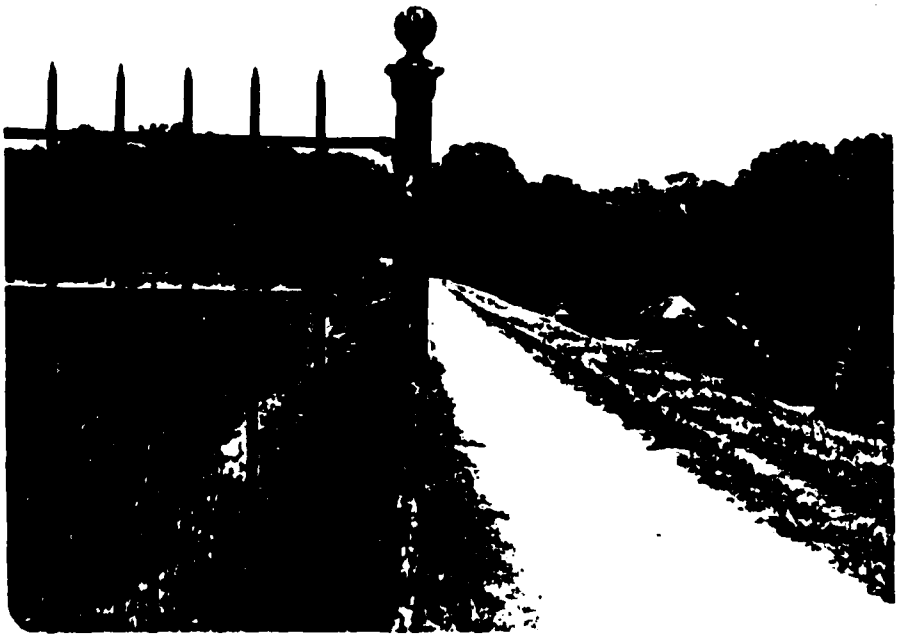
Date: July 5, 1984

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer
Date: 31 July 1984

GUILFORD RESERVOIR

Southern Embankment



Southern Crest

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

GUILFORD RESERVOIR
NDI ID NO. MD-106

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the dam inspection program is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. The Guilford Reservoir, constructed in 1893, is a square shaped earthfill embankment. The impoundment is used for finished water storage and distribution for the Baltimore City water supply. Inflow to and outflow from the reservoir are controlled by electrically operated butterfly valves and the operating modes of the pumps in the Guilford Pumping Station, and the water level inside the reservoir is continuously recorded. Because all significant inflow into the reservoir is controlled, detailed hydraulic and hydrologic analyses have not been performed.

The various features of the dam and impoundment are shown on the photographs in Appendix C and on the Plates in Appendix E. A description of the geology is included in Appendix F.

b. Location. The Guilford Reservoir is located in the Stony Run drainage basin in Baltimore, Maryland. The reservoir is shown on U.S.G.S. Quadrangle, Baltimore East, Maryland, at latitude N 39° 20' 42" and longitude W 76° 37' 00". A location map is included as Plate E-1.

c. Size Classification. Small (35 feet high, 134 acre-feet).

d. Hazard Classification. High hazard. Extensive residential development surrounds the impoundment.

e. Ownership. City of Baltimore, Department of Public Works, 600 Municipal Building, Baltimore, Maryland 21202.

f. Purpose of Impoundment. Finished water storage for Baltimore City Water Distribution System.

g. Design and Construction History. Guilford Reservoir was constructed in 1893. Construction drawings and design information are not available, however limited information on the typical section of the embankment has been obtained from the City of Baltimore.

h. Normal Operating Procedure. Finished water from the Ashburton Water Purification Plant is fed through the Baltimore City water transmisstion system by gravity to the Guilford Reservoir. Water levels are generally maintained between elevations 338 and 340.4. When the water level in the reservoir reaches elevation 340.4, electrically operated gate valves are closed to stop inflow into the reservoir. When the water demand has caused the water level to drop 1 to 2 feet, the gates are opened to allow the reservoir to fill.

1.3 Pertinent Data.

a. Drainage Area. Not applicable.

b. Discharge at Dam Site. Not applicable.

c. Elevation (Baltimore City Datum) (Feet).

Top of Dam	344.65 (low point on crest)
Maximum Pool	341.4(overflow to storm drain)
Normal Pool	338 to 340.4
Upstream Invert Outlet Works	Not Applicable
Downstream Invert Outlet Works	Not Applicable
Streambed at Centerline of Dam	Not Applicable
Maximum Tailwater	Not Appicable
Downstream Toe	+310

d. Reservoir Length (Feet).

Normal Pool	550 (North to South)
Maximum Pool	570 (North to South)

e. Storage (Acre-feet)

Normal Pool Level	104
Maximum Pool Level	110
Top of Dam	134

f. Reservoir Surface (Acres)

Normal Pool Level	7.0
Maximum Pool Level	7.2
Top of Dam	7.6

g. Dam.

Type	Earthfill
Length	2375± (crest perimeter)
Height	35' maximum
Top Width	15'±
Side Slopes	Downstream: 1V:2.5H to 1V:2H
	Upstream: 1V:1.5H
Zoning	Yes
Impervious Core	Puddled Trench Core
Cutoff	Yes
Grout Curtain	None

h. Regulating Outlet.

Type	Pressure Conduit
Length	Not Applicable
Closure	Gate and Butterfly Valves
Access	Guilford Gate House and Valve Vaults
Regulating Facilities	Two overflow pipes apparently leading to storm drains

i. Spillway. Not Applicable

SECTION 2
DESIGN DATA

2.1 Design.

a. Data Available. With the exception of a typical section of the embankment and some construction drawings for reservoir inlet and outlet pipework obtained from the City of Baltimore, no data is available concerning the design or construction of the Guilford Reservoir.

(1) Hydrology and Hydraulics. No hydrologic or hydraulic design data is available. The records include a "Storage Capacity vs. Elevation" curve for the reservoir, and piping diagrams for the present operation of the reservoir.

(2) Embankment. With the exception of a typical section of the proposed embankment, no design information is available for the embankment.

(3) Appurtenant Structures. Diagrams and some construction drawings are available for the system piping and inlet and outlet facilities.

b. Design Features.

(1) Embankment. The typical section indicates that the embankment is constructed with earth fill and has a puddled trench in the core of the embankment. The entire inside slope of the embankment is covered with stone riprap to retard erosion.

(2) Appurtenant Structures. Original design data is not available, but current piping diagrams and some pipework construction drawings have been provided by the City of Baltimore, and a schematic piping diagram is included as Plate E-3.

c. Design Data.

(1) Hydrology and Hydraulics. No design data is available. A "Storage Capacity vs. Elevation" curve dated November 17, 1927 has been obtained from the City of Baltimore and a tabulation derived from the Curve is included in Appendix D.

(2) Embankment. No design information is available for the embankment. A typical section of the embankment has been obtained and is included in Appendix E.

2.2 Construction. No data is available on the construction of the dam.

2.3 Operation. The reservoir is an active part of the Baltimore City Water Distribution System. Presently, finished water from the Ashburton Water Purification Plant is fed by gravity to the Guilford Reservoir. On occasions when the Ashburton plant filtering capacity is limited, finished water is pumped from the Vernon Pumping Station which in turn is fed from the Montebello Water Purification Plant. All inflow into the impoundment is controlled by valving in the inlet piping feeding the east and west sides of the reservoir. When the water level reaches elevation 340.4, electrically operated butterfly valves are closed to stop inflow into the reservoir. When the water level has dropped from 1 to 2 feet, the valves are opened and the reservoir allowed to refill.

2.4 Other Investigations. None reported.

2.5 Evaluation.

a. Availability. Design information on the embankment and original hydraulics for the Guilford Reservoir are not available.

b. Adequacy. The available data is not sufficient to allow for a technical assessment of the embankment. Current operating procedures are well documented and considered adequate to evaluate the hydraulic aspects of the Guilford Reservoir.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The on site inspection of the Guilford Reservoir consisted of:

(1) Visual inspection of the embankment and embankment toe.

(2) Visual examination of the appurtenant structures.

(3) Evaluation of the hazard potential.

The specific observations are shown on Plate A-1.

b. Embankment. The general inspection of the embankment consisted of a searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features. Saturated soil was noted along the toe of the slope at the southwest corner of the reservoir indicating a possible seepage area or a leak from a 48-inch water line approximately 30 feet down slope from the seepage area. Surface erosion was noted along the southern side of the reservoir, and an erosion gully was observed near the eastern end of the top of the south embankment.

The crest of the embankment varies in elevation by approximately 11 inches. Freeboard at the time of the inspection was approximately 6 feet. The embankment crest profile is included as Plate E-4.

c. Appurtenant Structures. The appurtenant structure consists of a Gate House located in the east side of the impoundment embankment and is in good condition.

d. Reservoir Area. The reservoir area consists solely of the area within the embankment, and is in good condition.

e. Downstream Channel. Not applicable. The area surrounding the reservoir consists of a residential community.

3.2 Evaluation. The visual examination and observations of the Guilford Reservoir indicate that the reservoir is in generally good condition with the exception of limited surface erosion and a possible seepage area near the embankment toe at the southwest corner. Investigations as to the cause of the seepage, are recommended.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. Because the Guilford Reservoir forms an important part of the water distribution system for Baltimore City, the operation of the impoundment is well defined and continuous from day to day.

4.2 Maintenance of the Dam (Embankment). The maintenance of the embankment is considered fair. More attention should be given by the Owner to repairing surface erosion features as they occur. The grass cover is kept well mowed.

4.3 Maintenance of Operating Facilities. The city of Baltimore maintains the mechanical and electrical equipment as required because of the importance of the reservoir to the City's Water distribution system. Maintenance records for this equipment are available from the Pumping Section, Bureau of Water and Waste Water, Baltimore City.

4.4 Warning System. No formal warning system exists for the reservoir, however, reservoir levels are sensed by a pressure sensor on the Guilford Pumping Station suction main and recorded continuously. Guilford Reservoir levels are also monitored on a 24-hour basis at the central telemetering control center at the Ashburton Water Purification Plant. Should it become necessary to drain the reservoir in the event of an emergency, inflow into the reservoir could be shut-off and the reservoir dewatered by using the two largest pumps in the Guilford Pumping Station. This could be accomplished within 19 hours based on a 45 million gallon per day pumping rate. Contract drawings for modifications to the reservoir inlet and outlet facilities indicate an existing 20-inch reservoir drain. Operating personnel do not know if the 20-inch drain is still functional.

4.5 Evaluation. The maintenance of the operating equipment is good, and the maintenance of the embankment is fair. It is recommended that the Owner repair the surface erosion of the embankment and investigate the possible seepage zone at the embankment toe near the southwest corner.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 a. Evaluation of Features. Original design data for the hydraulics and hydrology of the Guilford Reservoir are not available. Photocopies of "Storage Capacity vs. Elevation" curves for the Guilford Reservoir have been obtained from the City of Baltimore. A tabulation of reservoir storage versus pool elevation is included as Page D-2 of Appendix D.

Because all inflow with the exception of rainfall on the surface on the lake is controlled, hydrologic and hydraulic analyses have not been performed for Guilford Reservoir. The hazard classification for this small impoundment is considered to be high.

b. Experience Data. The reservoir water levels are monitored utilizing a pressure sensor on the Guilford Pumping Station suction main and automatically recorded continuously. Recorded water levels are correlated with water level readings taken from the reservoir staff gage once a week.

There is no information that would indicate that there has ever been a problem with Guilford Reservoir storing or passing rainfall from severe storms including hurricanes.

c. Visual Observations. Visual examination of the embankment and appurtenant structures indicate there are no problems with the hydraulic and hydrologic aspects of Guilford Reservoir.

d. Overtopping Potential. There is no evidence that potential overtopping is a problem. Inflow to the lake can be shut off by closing the electrically operated butterfly valves, one on the 48-inch reservoir feeder and one on the 30-inch gate house main. If lowering the reservoir level is necessary, water can be pumped from the reservoir through the Guilford pumping station. No evidence exists that Guilford Reservoir ever overtopped or has been in danger of overtopping.

e. Spillway Adequacy. There is no spillway for Guilford Reservoir, but the existing effluent pipes are considered adequate for the manner in which the reservoir is operated. The two overflow pipes with invert elevations of 341.4 apparently lead to the Baltimore City storm drainage system and are functional.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

A. Visual Observations

(1) Embankment. As discussed in Section 3, there are no major deficiencies which may adversely affect the stability of the reservoir embankment at this time.

(2) Appurtenant Structures. The structural condition of the appurtenant structures is considered to be satisfactory.

b. Design and Construction Data

(1) Embankment. What little data exists does not include any quantitative data to aid in assessing the structural stability of the dam. The old construction drawing showing a cross section of the embankment indicates that the embankment has a puddled clay trench. No conditions were observed that would significantly affect the stability of the dam.

(2) Appurtenant Structures. Available information does not provide adequate data to assess the structural adequacy of the appurtenant structures.

c. Operating Records. The structural stability of the dam is not considered to be affected adversely by the operational features of the dam.

d. Post-Construction Changes. Some construction drawings are available showing the construction of a 72-inch tunnel through the west reservoir embankment for housing the 48-inch finished water feeder. Limited drawings showing reservoir inlet/outlet piping modifications are also available.

e. Seismic Stability. Guilford Reservoir is located in Seismic Zone 1; and, based on visual observation, the stability of the dam appears to be adequate. The structure is presumed to present no hazard from earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that Guilford Reservoir is in satisfactory condition. A zone of saturated soil was noted along the toe of the slope of the southwest corner of the reservoir, indicating a possible seepage area, but at this time it would not appear to be adversely affecting embankment stability.

Because essentially all inflow into the reservoir can be controlled, the hydraulic and hydrologic aspects of the project are not significant.

b. Adequacy of Information. The available information on the design and construction of Guilford Reservoir is limited. Because of the way the water levels are controlled, and because of the fact that essentially no runoff enters the impoundment, the available information is considered adequate for the Phase I report.

c. Urgency. Although there is no urgency in instituting the remedial measures recommended below except for the investigation of the seepage area, the measures should be implemented in a timely manner.

d. Necessity of Additional Information. The Owner should investigate the seepage area in the southwest corner of the embankment to determine its source.

7.2 Recommendation/Remedial Measures.

The following remedial measures are recommended to be accomplished by the Owner:

a. Investigate the seepage area in the southwest corner of the embankment using either experienced in-house personnel or by contract with a qualified engineering firm possessing geotechnical engineering expertise. After investigation, implement recommended corrective measures to eliminate or control the seepage.

b. Repair the surface erosion located along the southern portions of the embankment.

c. Expand the maintenance program to include regularly scheduled inspections of the embankment to determine whether surface erosion and/or future seepage is occuring and needs correction.

d. Develop a formal warning system to alert the downslope residents in the event of emergencies.

APPENDIX A

VISUAL INSPECTION CHECKLIST

PHASE I

APPENDIX A
VISUAL INSPECTION CHECKLIST
PHASE I

Name of Dam: Guilford Reservoir County (or City): Baltimore City State: Maryland

NDI ID. No.: MD- 106 Type of Dam: Earth Hazard Category: High

Date(s) Inspection: May 28, 1980 Weather: Clear Temperature: 70's

Pool Elevation at Time of Inspection: 339± M.S.L. Tailwater at Time of Insp. N/A M.S.L.

Inspection Personnel:

J. D. Nauman

A. Zamboky

Review Inspection Personnel:

E. J. Zeigler

J. G. Mintiens

J. D. Nauman

J. D. Nauman Recorder

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion at junction of south and west embankments Erosion along top of south embankment Erosion channel at west end of south embankment - 5' wide, 1' deep	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical alignment varies by 11 inches Horizontal alignment satisfactory	
RIPRAP FAILURES	None	

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	N/A	
ANY NOTICEABLE SEEPAGE	Possible seepage noted at southwest corner of embankment toe (wet, saturated soil)	Additional investigations recommended
STAFF GAGE AND RECORDER	Staff gage maintained at northeast corner of reservoir. water levels measured by sensing pressure on conduit from reservoir.	staff gage readings and recorded water levels are compared once a week for compatibility
DRAINS	N/A	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None	
INTAKE STRUCTURE	Intake piping submerged	
OUTLET STRUCTURE	Underground gate valves in east and west valve vaults not observed	
OUTLET CHANNEL	None	
EMERGENCY GATE	N/A	

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

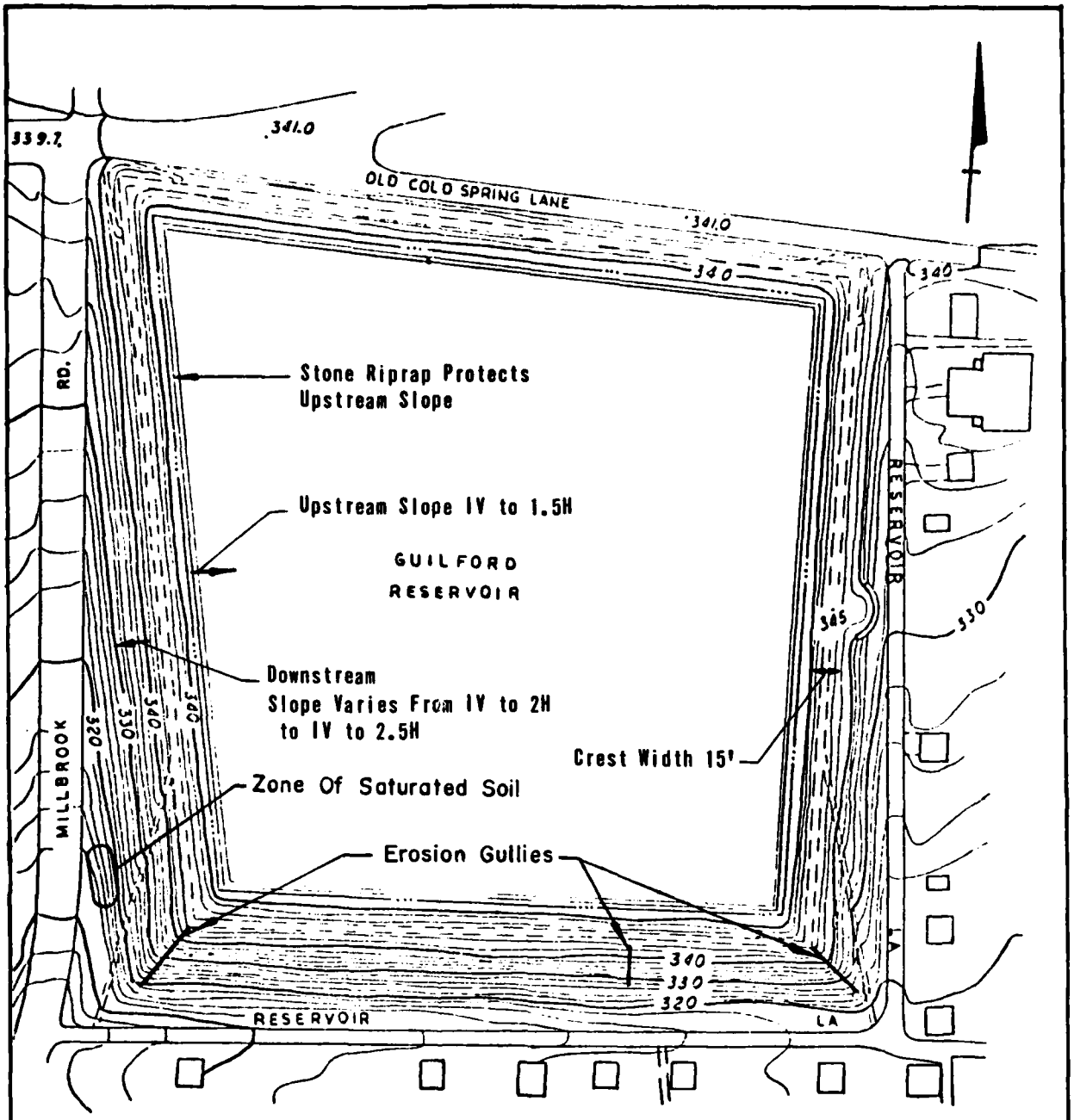
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Stone slope protection extends to within 1'± of the crest. Vegetation above riprap and on crest to fence line	
SEDIMENTATION	Some sedimentation observed on reservoir floor but cannot be quantified	Guilford Reservoir is not cleaned periodically
UPSTREAM RESERVOIRS	N/A	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	N/A	
SLOPES	N/A	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Guilford Reservoir is surrounded by a high value residential community	



SCALE IN FEET

0 100' 200'

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

GUILFORD RESERVOIR

CITY OF BALTIMORE

RESULTS OF VISUAL INSPECTION

JUNE 1980 PLATE A-1

APPENDIX B

ENGINEERING DATA CHECKLIST

PHASE I

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Guilford Reservoir

ID# NDI ID No. MD-106

ITEM	REMARKS
AS-BUILT DRAWINGS	As-built drawings of the reservoir are not available. Some construction drawings of reservoir piping and gate house are available.
REGIONAL VICINITY MAP	Guilford Reservoir is shown on essentially all maps of Baltimore City
CONSTRUCTION HISTORY	The reservoir was constructed in 1893. No history of the construction of the project is available.
TYPICAL SECTIONS OF DAM	A typical section of the embankment has been obtained from Baltimore City and is included as Plate E-2
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	Piping diagrams from the present water supply system are available and included as Plate E-3.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not Applicable
DESIGN REPORTS	None reported
GEOLOGY REPORTS	Geologic quadrangle mapping dated 1979 is available from the Maryland Geological Survey and included as Appendix F
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None reported

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

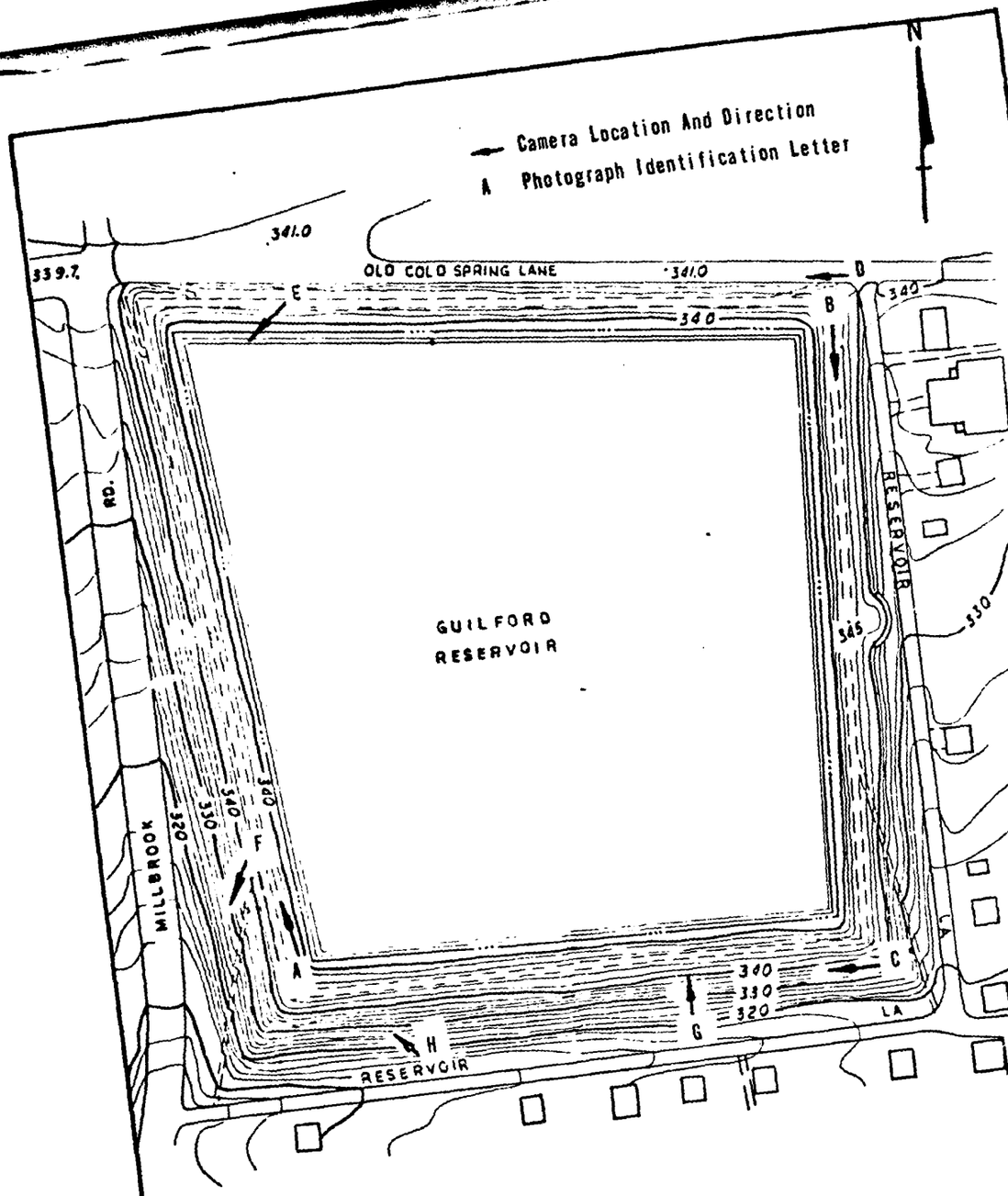
ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported
BORROW SOURCES	UnKnown
MONITORING SYSTEMS	Reservoir water levels are sensed by a pressure sensor on the Guilford Pumping station suction main and automatically recorded continuously.
MODIFICATIONS	Some drawings on modifications to the reservoir inlet and outlet facilities are available
HIGH POOL RECORDS	Available through the Baltimore City Bureau of Water and Wastewater, Pumping Section

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None reported
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported
MAINTENANCE OPERATION RECORDS	Maintenance and operating records are maintained for the mechanical and electrical equipment by the City of Baltimore Bureau of Water and Waste Water, Pumping Section
SPILLWAY PLAN SECTIONS DETAILS	N/A
OPERATING EQUIPMENT PLANS AND DETAILS	Current piping diagrams for this portion of the Baltimore water supply system are available From the City of Baltimore

APPENDIX C

PHOTOGRAPHS



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

GUILFORD RESERVOIR

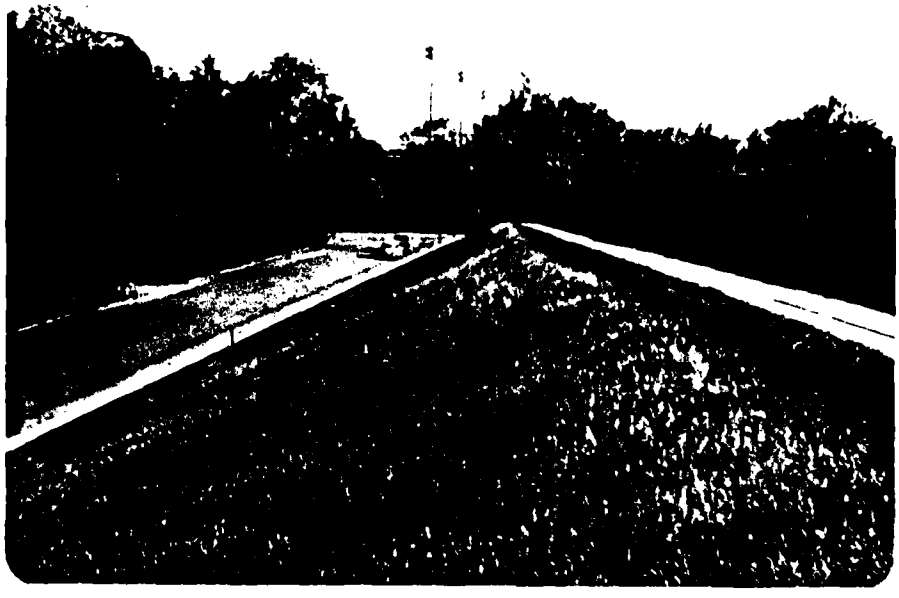
CITY OF BALTIMORE

GUIDE TO LOCATION OF PHOTOGRAPHS

PLATE C-1

JUNE 1980

GUILFORD RESERVOIR



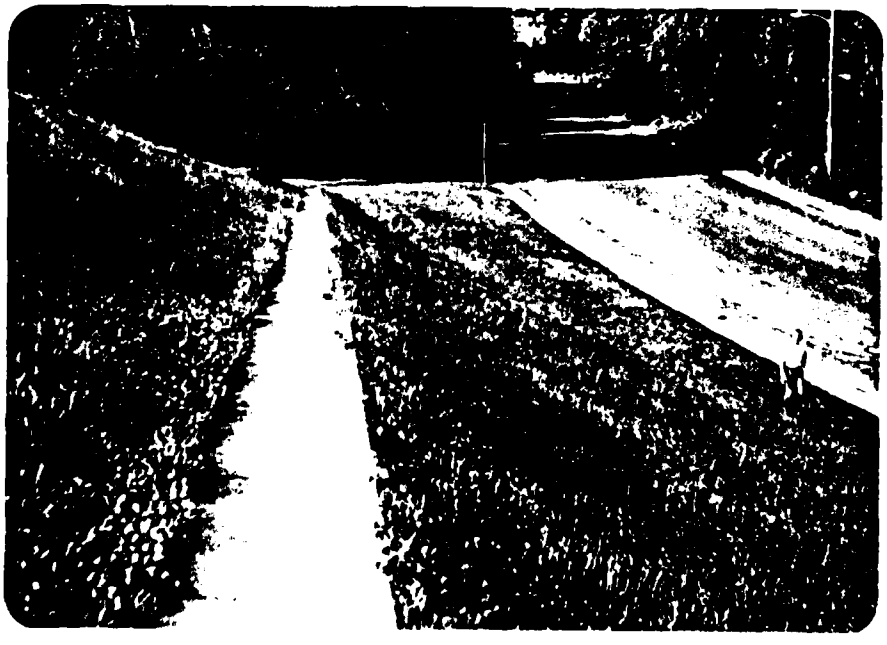
A. Western Embankment - Crest and Downstream Slope

B. Eastern Embankment and Gate House

C. Southern Embankment - Downstream Slope

D. Northern Embankment - Downstream Slope

E. Riprap Slope Protection



F. Southwest Corner of Embankment-Saturated Soil at Toe where man stands.

G. Erosion Gully at Top of Souther Embankment

H. Erosion Has Exposed Soil on Southern Embankment

APPENDIX D

HYDROLOGY AND HYDRAULICS

EVALUATION OF AFFECTS OF
MAXIMUM PROBABLE PRECIPITATION
UPON RESERVOIR WATER SURFACE

Name of Dam: Guilford Reservoir (NDI-106)

Drainage Area: (Reservoir Surface Area at Maximum Pool) = 0.011 sq.mi.

Unadjusted Probable Maximum Precipitation (PMP) = 24.2 inches/24 hrs.
for 200 square miles

Adjusted PMP for Shape Factor
for 200 square miles = 24.2 inches/24 hrs. x .80 = 19.4 inches/24 hours[1,2]

Adjusted PMP for Drainage Area = 19.4 x 123% = 23.9 inches/24 hours[1]
for 10 square miles

(Note: PMP curves from Hydrometeorological Report 33 do not extend beyond drainage of less than 10 square miles. While the lake surface area is substantially less than this value, no extension of the published curves has been attempted.)

Maximum Pool Elevation = 341.4 feet above m.s.l.

Pool Elevation Following Occurrence of PMP of 24 hour Duration =
341.4 + 2.0 feet = 343.4 feet above m.s.l.

Top of Dam Elevation = 344.65 feet above m.s.l. (low point)

Remaining Freeboard = 344.65 - 343.4
= 1.25 feet

Conclusion: Dam would not be overtopped following storm having an intensity equal to PMP derived above.

[1] Hydrometeorological Report 33, U.S. Army, Corps of Engineers, 1956.
[2] Engineering Circular 1110-2-27, U. S. Army, Corps of Engineers, August, 1966.

Tabulation of Reservoir Storage Capacity Vs. Pool Elevation[1]

Name of Dam: Guilford Reservoir (NDI 106)

Pool Elevation feet above m.s.l.[2]	Surface Area acres	Reservoir Storage acre-feet
321.4 (Reservoir Bottom)	-	
324	-	8
326	-	16
328	-	27
330	-	39
332	-	50
334	-	62
336	-	75
338	-	88
340	-	101
341.4 (Maximum Pool)	7.2[3]	110
344.65 (Top of Dam)	7.6[3]	134[4]

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[1] Source: Guilford Reservoir Capacity Curve, City of Baltimore, Department of Public Works, Bureau of Water Supply, November 27, 1927.

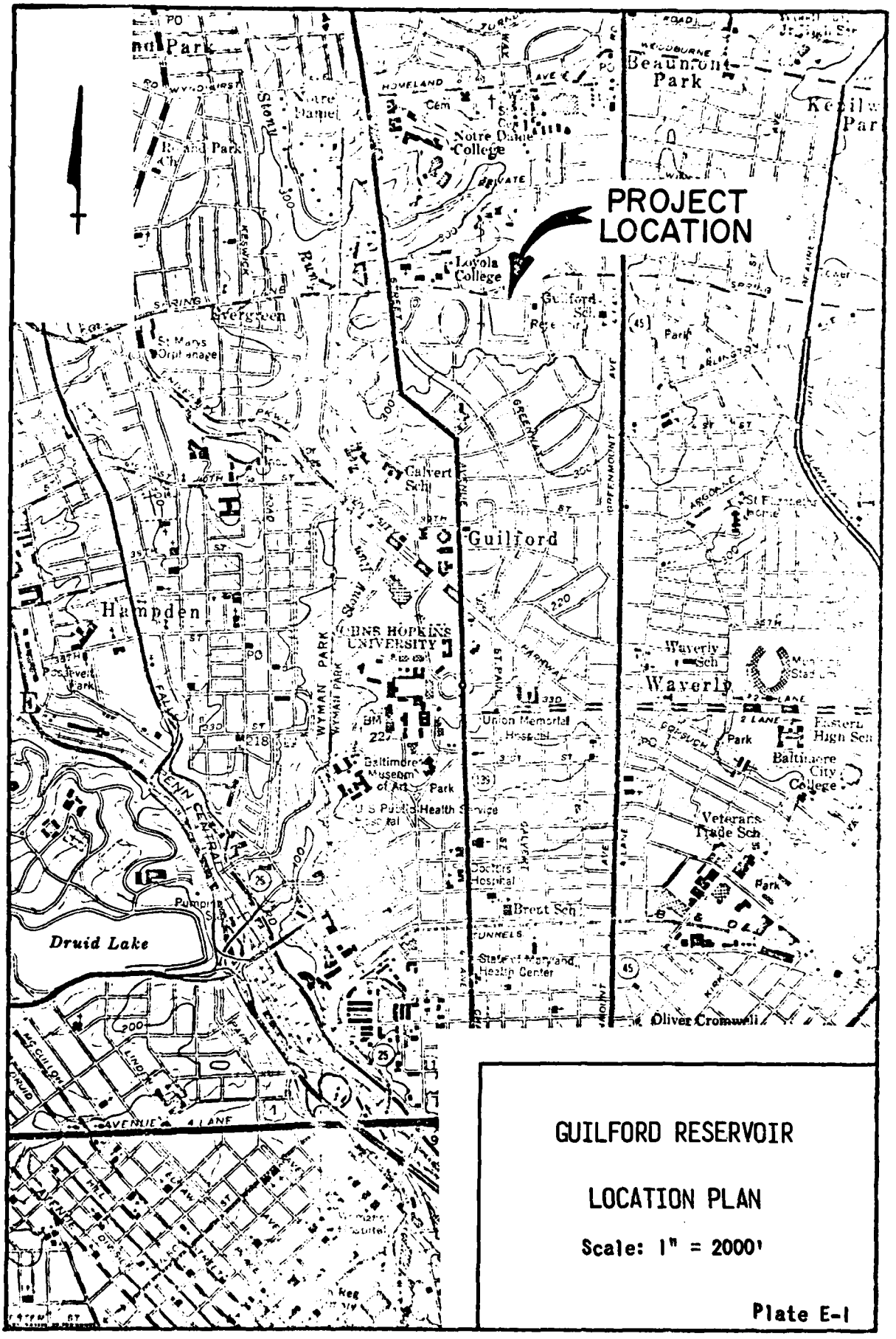
[2] Baltimore Topographical Survey Datum

[3] Area computed from Baltimore City 100-scale photogrammetric mapping.

[4] Computed by Rummel, Klepper & Kahl

APPENDIX E

PLATES

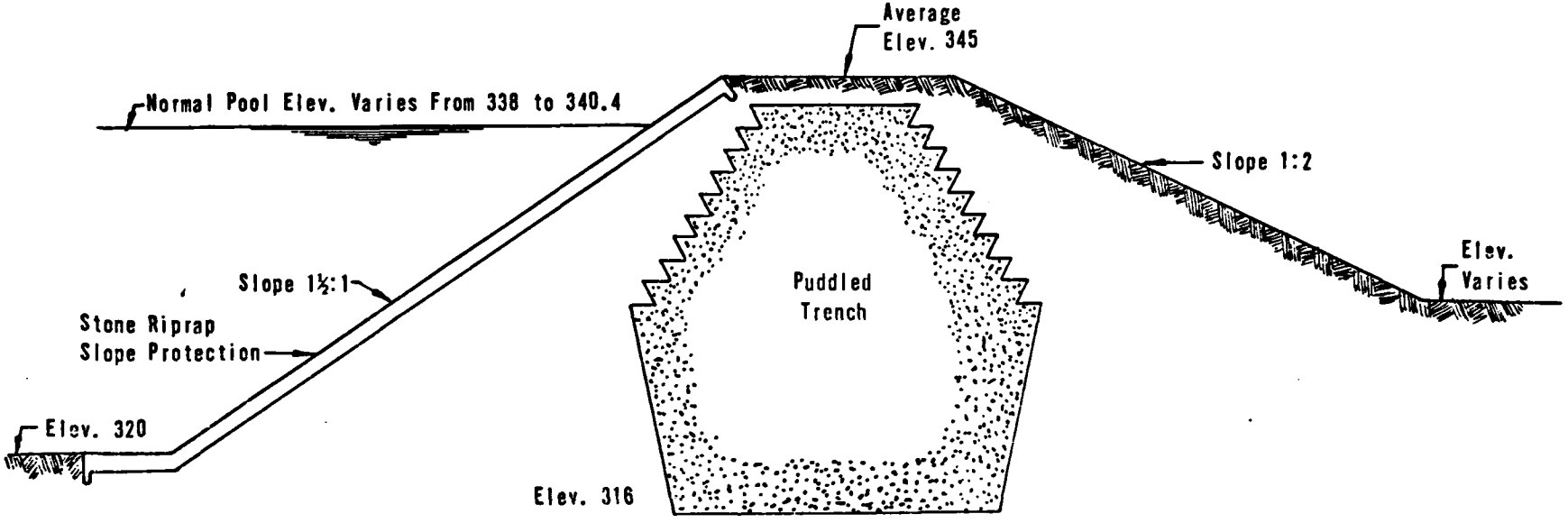


GUILFORD RESERVOIR

LOCATION PLAN

Scale: 1" = 2000'

Plate E-1



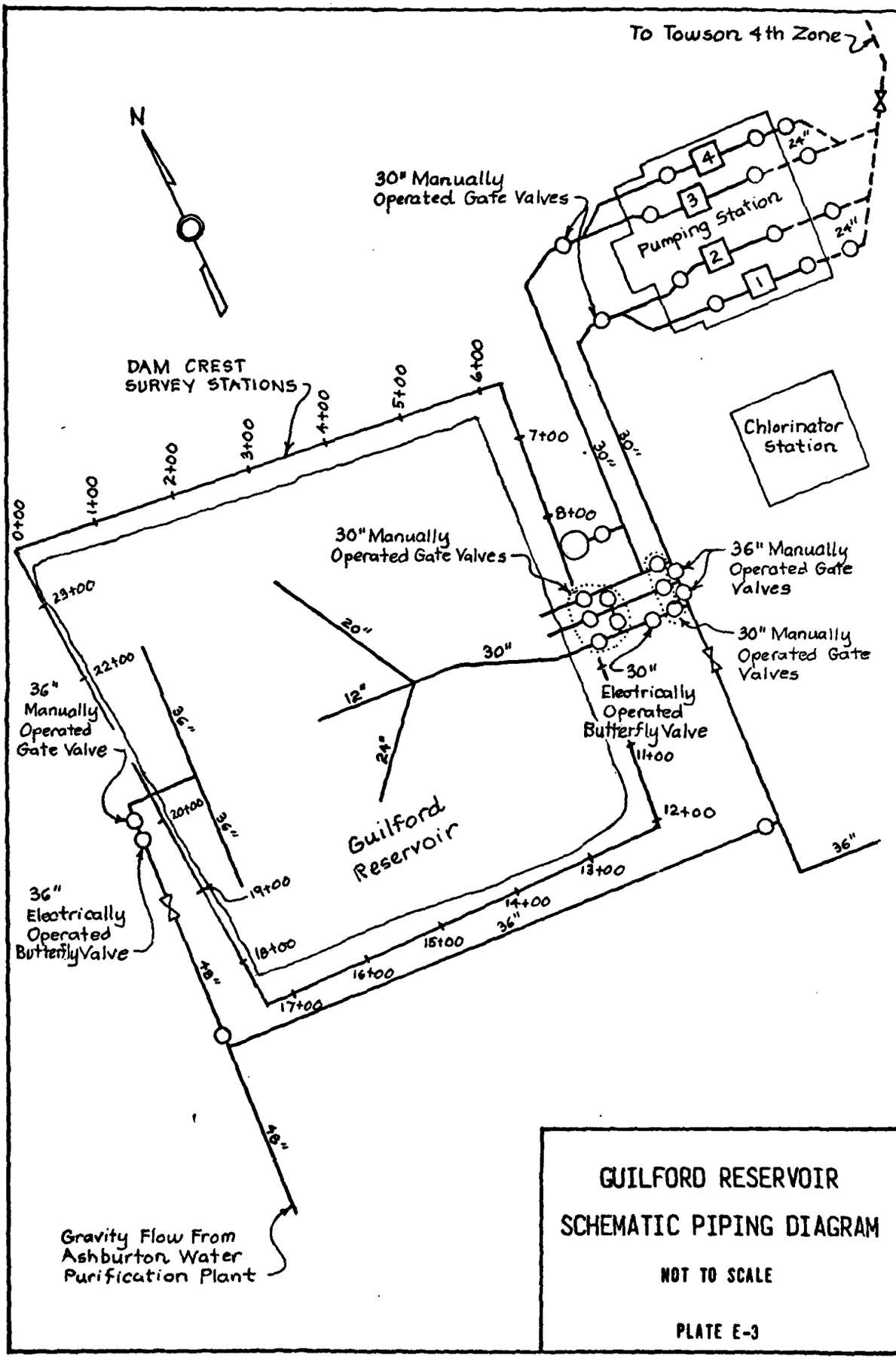
Scale 1" = 10'

TYPICAL SECTION

GUILFORD RESERVOIR

TRACED FROM PRINT
DATED DEC. 17, 1889
BALTO. CITY FILE NO. F.-9 - S.-2

PLATE E-2

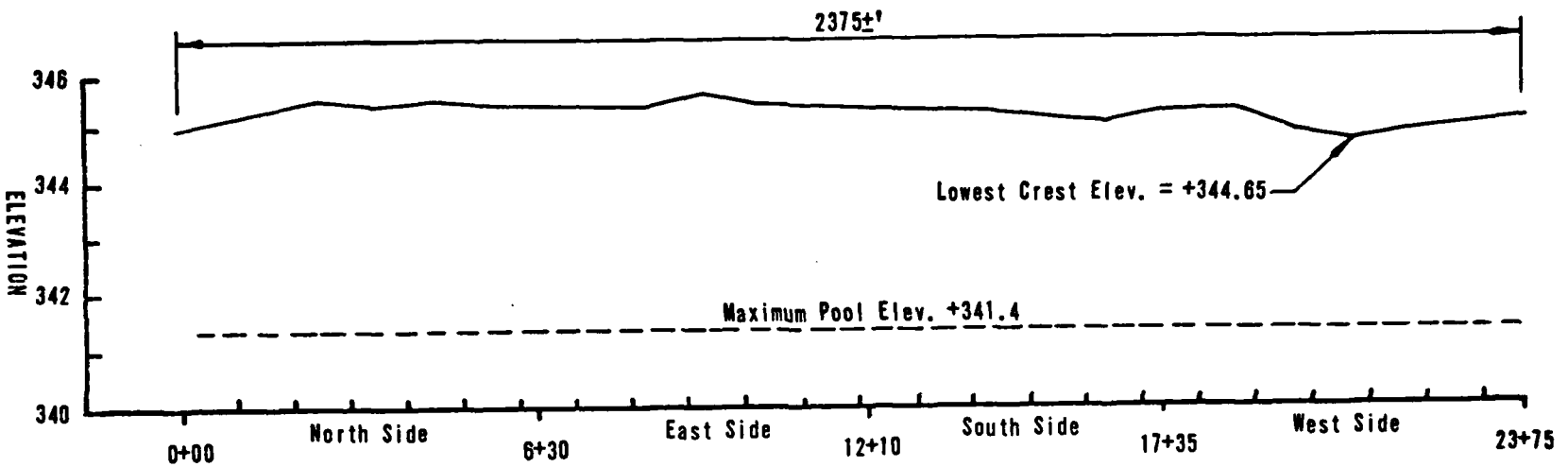


GUILFORD RESERVOIR

SCHEMATIC PIPING DIAGRAM

NOT TO SCALE

PLATE E-3



DAM CREST PROFILE

(LOOKING DOWNSTREAM)

Note: Dam Crest Survey Stations
Are Shown On Plate E-3

Datum Elevation Is Interpolated
From 100 Scale Photogrammetry
Obtained From The City Of
Baltimore

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION REPORT

GUILFORD RESERVOIR

CITY OF BALTIMORE

DAM CREST SURVEY

JUNE 1980

PLATE E-4

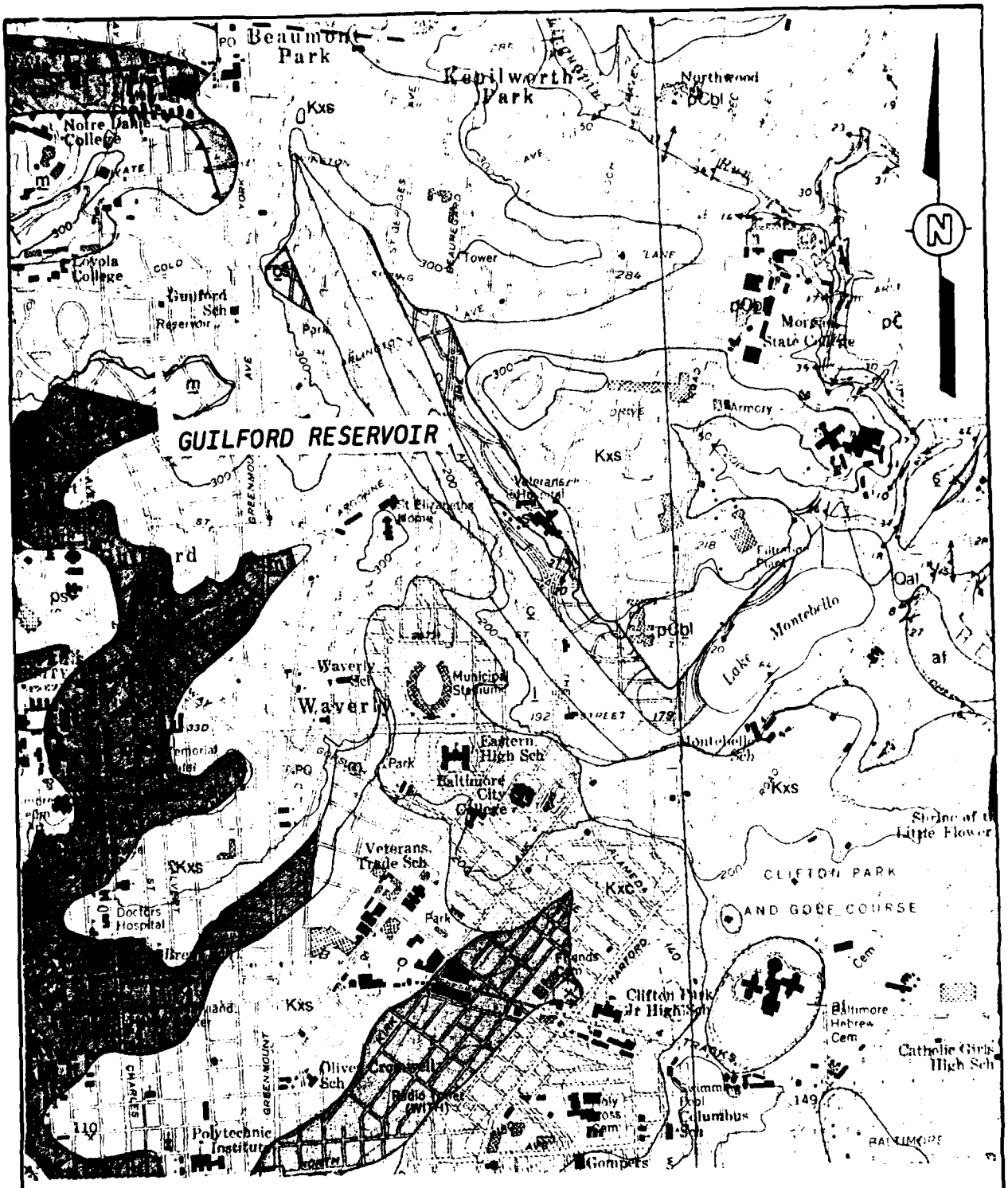
APPENDIX F

GEOLOGY

GUILFORD RESERVOIR

GEOLOGY

Guilford Reservoir is located in the Eastern Division of the Piedmont Physiographic Province. The Piedmont Province is characteristically underlain by a complex series of metamorphosed sedimentary and igneous rocks, which in the project area are overlain by water borne sedimentary deposits. Guilford Reservoir is underlain by the sandy facies of the Lower Cretaceous Patuxent Formation. The formation is characterized by interbedded sand, gravel, silt, and clay. The sands and gravels of the formation are typically quartzose. The Patuxent formation lies unconformably over the weathered Baltimore Greiss of Pre-Cambrian age.



SCALE

1000' 0 1000' 2000' 3000' 4000'

REFERENCE:

GEOLOGIC MAP OF THE BALTIMORE EAST QUADRANGLE, PREPARED BY STATE OF MARYLAND, MARYLAND GEOLOGICAL SURVEY, DATED 1979, SCALE 1" = 2000'

GUILFORD RESERVOIR

GEOLOGY MAP

RUMMEL, KLEPPER & KAHL

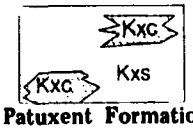
LEGEND

Artificial Fill

Consists of heterogeneous materials such as rock, unconsolidated sediment, slag, refuse, and dredge spoil. Only major areas of filled or highly disturbed ground have been mapped, such as refilled pits, diked flood plains, and transportation corridors across topographically low areas. Thickness 3 to 6 m (10 to 15 ft).

Alluvium

Interbedded gravel, sand, silt, and clay of varied composition and sorting. Typically confined to flood plains of perennial streams, upland gathering areas, and marshes adjacent to estuaries. Sediment size, sorting, and mineralogy are strongly controlled by the source rocks and geomorphic setting. The quartzose sands and polymict gravels are typically well bedded and loosely compacted; the silts and clays are often water saturated and poorly bedded. Minor amounts of colluvium (unmapped) may interfinger with alluvium at or near the bases of slopes. Structural symbols on alluvium represent bedrock exposures in stream valleys. These are typically either along the margins of the flood plain or close to the main channel of the drainage. Thickness 0.5 to 6 m (2 to 15 ft).



Patuxent Formation

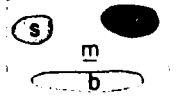
Kxs *Sand facies. Highly variable, interbedded sand, gravel, silt, and clay containing ferruginous cements. Sand and gravel typically quartzose with a buff, kaolinitic clay-silt matrix. Sediments are organized into fining-upward packages 3 to 5 m (10 to 15 ft) thick consisting of planar-bedded gravel with clay clasts or cross-bedded sands at the base grading upward to laminated or massive silt-clay at the top. Elsewhere vertical sequences show abrupt sediment size changes and erosive contacts. The heavy mineral suite is characterized by staurolite, zircon, tourmaline, and kyanite. Sparse silicified and abundant iron-oxide replacements of both cycadioids and coniferous wood are present throughout the Formation. These sediments were deposited in a high-gradient, braided stream complex.*

Kxc *Clay facies. Light gray to black or brown clay containing variable amounts of quartz silt and gravel; local concentrations of lignitic, partially pyritized wood or macerated leaf and cone debris are associated with some sideritic concretions. Thin planar beds of sand and/or gravelly clay are interbedded with massive clays. These isolated clay pods are thought to be accumulations on deflated surfaces such as abandoned stream channels or pre-Cretaceous topographic lows.*

Thickness 2 to 35 m (7 to 115 ft).

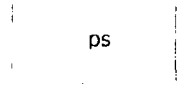
James Run Formation (Carroll Gneiss Member)

Fine- to medium-grained, generally layered biotite-quartz-plagioclase gneiss, locally with muscovite. Mica absent and magnetite present in some outcrops. Includes subordinate, concordant plagioclase-hornblende gneiss (amphibolite) in layers generally a few centimeters to a few decimeters thick, but locally as much as several meters thick. Concordia plot yields age of 550 million years.



Mount Washington Amphibolite

Chiefly uniform, medium- to coarse-grained amphibolite consisting of plagioclase plus actinolite and/or hornblende. Includes minor massive actinolite rock (actinofels).



Potomac Group (?)

These unconsolidated to locally iron-oxide cemented sediments are lithologically similar to Patuxent Formation sand units mapped elsewhere. Sediment caps composed of such materials are distributed discontinuously west of the intact Coastal Plain sequence and have not yielded palynomorphs for biostratigraphic control. Compositionally these are poorly to well-sorted quartz sands containing variable amounts of vein quartz gravel. Variable amounts of silt and clay are concentrated in lenses or pods or disseminated as matrix. Thickness 0.5 to 10 m (2 to 30 ft).

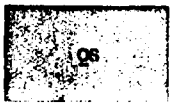
REFERENCE:

GEOLOGIC MAP OF THE BALTIMORE EAST QUADRANGLE, PREPARED BY STATE OF MARYLAND, MARYLAND GEOLOGICAL SURVEY, DATED 1979

GEOLOGY MAP LEGEND

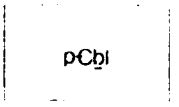
RUMMEL, KLEPPER & KAHL

LEGEND



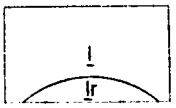
Oella Formation (Sweathouse Amphibolite Member)

Fine- to medium-grained, very well foliated plagioclase-hornblende gneiss (amphibolite) commonly with epidote and quartz. Generally thinly layered on a scale of centimeters due to variations in the ratio of dark to light minerals. Includes minor mica-quartz schist and gneiss.



Baltimore Gneiss (layered gneiss member)

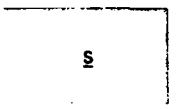
Generally medium-grained biotite-quartz-plagioclase-microcline gneiss with a conspicuously variable biotite content such that outcrops typically have a layered appearance. Contacts vary from sharp to gradational and may separate layers more than a meter thick, laminae or veins a centimeter or so thick, or lenses of one rock type enclosed by another. Locally the concentration of biotite in the rock is so great as to constitute a schist. Local textural variations include the development of pegmatitic texture and the rare occurrence of feldspar augen. Most outcrops show abundant small-scale folds. Dated radiometrically at 1,000 to 1,300 million years.



Loch Raven Schist

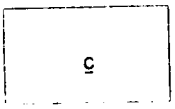
Uniform, medium-grained biotite-plagioclase-muscovite-quartz schist containing, in places, tiny tourmaline prisms, and pegmatitic clots consisting largely of feldspar and tourmaline. Locally very feldspathic. Includes a single, thin, unmapped layer of amphibolite along Herring Run near the top of the formation. Correlative rocks collected from the Montebello aqueduct north of the Municipal Stadium contain garnet.

lr *Rush Brook Member. Fine-, medium-, and coarse-grained biotite-feldspar-muscovite-quartz schist and medium-grained muscovite-microcline quartzite interlayered on a scale of tens of centimeters to meters. May include subordinate Gunpowder Gneiss as intrusive sills.*



Setters Formation (undivided)

Slabby weathering, medium-grained, thin-bedded muscovite-microcline quartzite with tourmaline. Crops out only northeast of Lake Montebello and along Loch Raven Boulevard near the Veterans Hospital. Its presence elsewhere is inferred on the basis of topography, extrapolation from outcrops in the adjacent Baltimore West quadrangle, and its known occurrence in the Montebello aqueduct where it includes feldspar-mica-quartz schist and mica quartzite, both locally with tourmaline.



Cockeysville Marble (undivided)

Crops out only during unusually low water levels along the southeast shore of Lake Montebello, north-northeast of Montebello School where it is a very impure calcite marble containing phlogopite, feldspar, and quartz. Its presence elsewhere is inferred on the basis of topography, and its known occurrence in the Montebello aqueduct where it includes muscovitic metadolostone and medium- to coarse-grained, blue-streaked calcite marble with a variable content of phlogopite.

Raspeburg Amphibolite

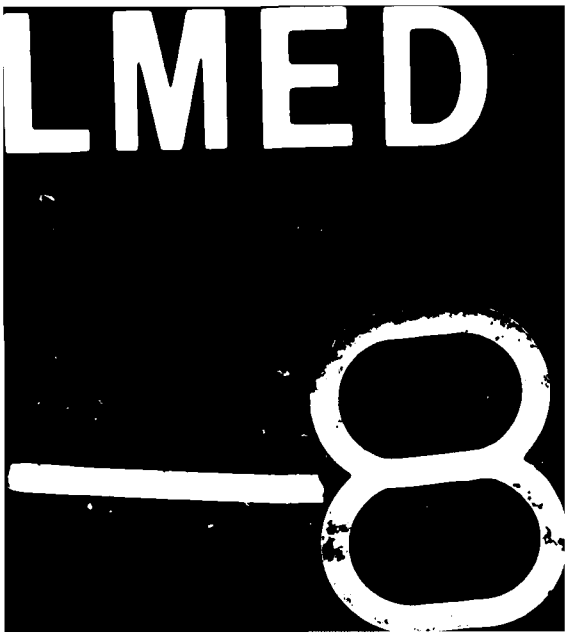
Generally uniform, medium- and coarse-grained, well foliated plagioclase-hornblende gneiss (amphibolite), locally with streaks or thin layers of more feldspathic rock. Weathered surfaces commonly have a pitted appearance due to leaching of plagioclase. Local variations in grain size or in hornblende-plagioclase ratio define a layering on a scale of centimeters to decimeters.

REFERENCE:

GEOLOGIC MAP OF THE BALTIMORE EAST QUADRANGLE, PREPARED BY STATE OF MARYLAND, MARYLAND GEOLOGICAL SURVEY, DATED 1979

GEOLOGY MAP LEGEND

RUMMEL, KLEPPER & KAHL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